

**Claims:**

1. A test system for monitoring a WDM transmission system that employs at least one optical amplifier, comprising:
  - a test signal generator generating an optical test signal;
  - an optical coupler combining the test signal with at least one data signal located at a given channel wavelength, said optical test signal being located at one or more channel wavelengths distinct from the given channel wavelength and corresponding to an idler channel wavelength employed to maintain a prescribed operational state of said at least one optical amplifier; and
  - an optical performance monitor receiving at least a portion of the optical test signal.
2. The test system of claim 1 further comprising at least one optical loopback path associated with said at least one optical amplifier, said at least one optical loopback path optically coupling a first unidirectional optical transmission path to a second unidirectional optical transmission path and wherein said optical performance monitor receives a portion of the optical test signal conveyed over said at least one optical loopback path.
3. The test system of claim 1 wherein said test signal generator comprises:
  - a tone generator generating a tone having a pseudo-random sequence; and
  - an optical transmitter coupled to the tone generator and generating an optical test signal based on the pseudo-random tone;
4. The test system of claim 1 wherein said optical performance monitor comprises:
  - a delay system coupled to said tone generator and delaying the optical test signal based on a location of said at least one optical amplifier; and
  - a comparator coupled to said delay system correlating the output of the delay system with the pseudo-random tone generated by the tone generator.

5. The test system of claim 1 wherein said optical performance monitor includes a signal performance monitor for selectively monitoring said one or more channel wavelengths of the test signal and said at least one data signal.
6. The test system of claim 5 wherein said signal performance monitor is a Q-monitor.
7. A method for monitoring a WDM transmission system that employs at least one optical amplifier, said method comprising the steps of:
  - generating an optical test signal and at least one optical data signal located at a given channel wavelength, said optical test signal being located at one or more channel wavelengths distinct from the given channel wavelength and corresponding to an idler channel wavelength employed to maintain a prescribed operational state of said at least one optical amplifier;
  - directing said optical test signal and said at least one optical data signal onto an optical transmission path of the WDM transmission system; and
  - monitoring a performance characteristic of said optical test signal.
8. The method of claim 7 wherein said monitoring step comprises the step of receiving a portion of the optical test signal that has traversed at least one optical loopback path optically coupling a first unidirectional optical transmission path to a second unidirectional optical transmission path.
9. The method of claim 7 wherein the step of generating said optical test signal further comprising the steps of:
  - generating a tone having a pseudo-random sequence; and
  - generating said optical test signal based on the pseudo-random tone.
10. The method of claim 7 wherein said performance characteristic is a Q-value.
11. The method of claim 7 wherein said performance characteristic is selected from the group consisting of a Q-value, a bit error rate, and an optical-signal-to-noise ratio.

12. The method of claim 7 further comprising the step of monitoring a performance characteristic of said at least one optical data signal.
13. The method of claim 12 wherein said performance characteristic is a Q-value.
14. The method of claim 12 wherein said performance characteristic is selected from the group consisting of a Q-value, a bit error rate, and an optical-signal-to-noise ratio.
15. A WDM optical transmission system, comprising:
  - first and second transmitter/receiver terminals;
  - an optical transmission path optically coupling the first transmitter/receiver terminal to the second transmitter/receiver terminal, said optical transmission path including at least one optical amplifier;
  - a test system associated with the first transmitter/receiver terminal, said test system including:
    - a test signal generator generating an optical test signal;
    - an optical coupler combining the test signal with at least one data signal located at a given channel wavelength, said optical test signal being located at one or more channel wavelengths distinct from the given channel wavelength and corresponding to an idler channel wavelength employed to maintain a prescribed operational state of said at least one optical amplifier; and
    - an optical performance monitor receiving at least a portion of the optical test signal.
16. The WDM transmission system of claim 15 further comprising at least one optical loopback path associated with said at least one optical amplifier, wherein said optical transmission path includes first and second unidirectional optical transmission paths, said at least one optical loopback path optically coupling said first unidirectional optical transmission path to said second unidirectional optical transmission path and wherein said optical performance monitor receives a portion of the optical test signal conveyed over said at least one optical loopback path.

17. The WDM transmission system of claim 15 wherein said test signal generator comprises:

- a tone generator generating a tone having a pseudo-random sequence; and
- an optical transmitter coupled to the tone generator and generating an optical test signal based on the pseudo-random tone;

18. The WDM transmission system of claim 15 wherein said optical performance monitor comprises:

- a delay system coupled to said tone generator and delaying the optical test signal based on a location of said at least one optical amplifier; and
- a comparator coupled to said delay system correlating the output of the delay system with the pseudo-random tone generated by the tone generator.

19. The WDM transmission system of claim 15 wherein said optical performance monitor includes a signal performance monitor for selectively monitoring said one or more channel wavelengths of the test signal and said at least one data signal.

20. The WDM transmission system of claim 19 wherein said signal performance monitor is a Q-monitor.